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LOCUST FLIGHTS EAST OF THE MISSISSIPPI.*

By Prof. C. V. Riley, of St. Louis.

To the unscientific mind there are few things more difficult of apprehension than that species, whether of plants or animals, should be limited in geographical range to areas not separated from the rest of the country by any very marked barriers, or by visible demarkations. Yet it is a fact well known to every naturalist, and the geographical distribution of species forms at once one of the most interesting and one of the most important studies in natural history. Some species have a very limited, others a very wide, range; and while in the course of time—in the lapse of centuries or ages—the limits have altered in the past and will alter in the future, they are, for all practical purposes, permanent in present time. These limits may in fact, for the purpose of illustration, be likened to those which separate different nations. Though frequently divided by purely imaginary lines, the nations of Europe, with their peculiar customs and languages, are well defined. Along the borders where the nations join, there is sometimes more or less commingling; at other times the line of demarkation is abrupt—and in no case could emigrants from the one long perpetuate their peculiarities unchanged in the midst of the other. Yet in the battle of nations the lines have changed, and the map of Europe has often been remodeled. So it is with species. On the borders of the areas not abruptly defined, to which species are limited, there is more or less modification from the typical characters and habits; while in the struggle of species for supremacy, the limits may vary in the course of time. The difference is, that the boundaries of nations result from human rather than natural agencies, while those of species result most from the latter, and are therefore more permanent. It is scarcely necessary to add that these remarks apply to species as they are found in nature, and uninfluenced by man. The spread of species by man's direct or indirect influence is equally interesting; but it is not my purpose to consider it in this connection.

I found some difficulty at the late conference of Governors at Omaha to consider the locust problem, in satisfying those present that the Rocky Mountain locust could not permanently thrive south of the 44th parallel or east of the 100th meridian, and that there was no danger of its ever extending so as to do serious damage east of a meridian line drawn a little west of the center of Iowa. They could not see what there was to prevent the pest from overrunning the whole country, and thought that Congress should be appealed to not alone on behalf of the country that had suffered from its ravages, but on behalf of the whole country that is threatened therefrom. In my last two reports I have discussed the native home of the species, and I will here endeavor to present the conditions which prevent its permanent settlement in the country to which it is not native.

Briefly, the species is at home and can come to perfection only in the high and dry regions of the Northwest, where the winters are long and cold and the summers short; and whenever it migrates and oversweeps the country to the south or southeast, in which it is not indigenous, the changed con-

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ditions are such that the first generation hatched out in that (to it) unnatural climate, either forsakes it on the wing, or perishes from debility, disease and general deterioration. On the soundness of this conclusion depends the future welfare of the most of the more fertile States between the Mississippi and the Rocky Mountains; and science, as well as past experience, shows it to be sound. Upon this hypothesis the people of nearly the whole country so scourged during this year, and so threatened next spring, may console themselves that the evil is but temporary; they may have to fight their tiny foe most desperately next spring, but they have also the assurance that even if he proves master of the field, he will vacate in time to allow of good crops of some of the staples, and that he may not return again for years. On the other hypothesis—for which there is no apparent, and no real reason—ruin stares them inevitably in the face.

The causes which limit the eastward flight of the winged swarms that come from the northwest, are, with the majority of the people, still more difficult to appreciate; for most persons can see no reason why a swarm that overruns the western portions of Minnesota, Iowa and Missouri, should not extend to the eastern borders of the same States, or into Illinois, Indiana, Ohio, and eastward. Without discussing some of the more occult climatic influences that bear on the belief that they never will, the principal arguments rest in the facts that—1st, the power of flight of any insect that has a limited winged existence, must somewhere find a limit; 2d, that all past experience has shown that *Caloptenus spretus* has never extended, in a general way, beyond the limit indicated, and that as long as the present average conditions of wind and climate prevail, it is reasonable to suppose that it never will.

One of the principal difficulties in the way of a proper apprehension of the facts is found in the failure, in the popular mind, to discriminate between species. The ordinary newspaper writer talks of the grasshopper, or the locust, as though all over the country and all over the world there was but one and the same species. One of the governors present at the conference referred to, was at first fully of the belief that our Rocky Mountain pest came all the way from Asia. In the case of this destructive species, even some entomologists have added to the difficulty by erroneously claiming that it is common all over the country to the Atlantic ocean.

The above thoughts are suggested by the following reports, that have just met my eye, in the Cincinnati Gazette of the 24th inst., from Dayton and Hamilton, respectively:

“The advent of Kansas grasshoppers, over Sunday and until Monday evening, in great numbers throughout this city, is a most remarkable incident. They were found early Sunday morning, and left, as suddenly as they came, on Monday evening.”

“A shower of mammoth grasshoppers came down upon our town and vicinity on Saturday night. We have never seen such large ones before, and we understand from old citizens that they are entire strangers in this part of the country. We saw a boy have a string tied to two of them, (which were as long as a man’s finger,) trying to drive them, and he succeeded pretty well.”

“A flock of grasshoppers alighted in Hamilton about 11 o’clock on Saturday night, from the northwest. Those that were not drowned in the river or killed by the heavy rain, were probably gobbled up before Sunday night by the chickens.”

Such reports as these very naturally confirm the unscientific in the idea that the locust plague of the West, or so-called “Kansas grasshopper,” has

overstepped the limits entomologists ascribe to it, and is upsetting the conclusions of science. The same swarm passed over Oxford, in the same State, in a southwesterly direction, and fortunately that veteran and well-known apiarian, the Rev. L. L. Langstroth, who has not forgotten to be a close observer, had specimens sent to me. They prove to be the American acridium (*Aceridium Americanum*). As stated in my Eighth Report, it is the largest and most elegant locust, the prevailing color being dark brown, with a pale yellowish line along the middle of the back when the wings are closed. The rest of the body is marked with deep brown, verging to black, with pale reddish-brown, and with whitish or greenish-yellow; the front wings being prettily mottled, the hind wings very faintly greenish, with brown veins, and the hind shanks generally coral-red, with black-tipped white spines. The species is quite variable in color, size and marks, and several of the varieties have been described as distinct species—by the species grinders. It has a wide range, hibernates in the winged condition, and differs not only in size and habits from the Rocky Mountain locust, but entomologically is as widely separated from it as a sheep from a cow. It is a species common over the country every year, and during exceptional years becomes excessively numerous and acquires the migratory habit, its wings being long and well adapted to flying. It has been very abundant the present year, and toward the end of July, while in the unfledged condition, did an immense amount of damage to the cotton and other crops of Georgia and South Carolina. The papers were full of graphic accounts of their destruction, and editors not only very generally took it for granted that they had to do with the Western spretus, but Mr. T. P. Janes, Commissioner of Agriculture for Georgia, in his circular No. 27, supposed they were the same. Specimens which he subsequently sent me, however, at once revealed their true character.

In September, 1875, large swarms of locusts passed over Illinois, and those who were bent on the idea that there was no reason why that State should not be overrun with the Rocky Mountain locust, found the apparent justification for their views in the said swarms. Yet these proved to be composed of three species,* indigenous to Illinois, and every year common there; and after settling they did no harm, and nothing was heard of their progeny the following spring—all of which would have been very different had it been a question of the Western spretus.

The damage done by some of the more common locusts that occur over the country, is sometimes very great, especially during hot, dry years. In some of the New England States their ravages have, in restricted localities, fairly equaled those of the voracious spretus of the West. But while a few of them, under exceptional circumstances, develop the migratory habit, they none of them ever have, and in all probability never will, compare with *Caloptenus spretus* in the vastness of its migrations and in its immense power for injury over extensive areas.

In economic entomology, discrimination between species is very important, and a lack of it often leads to most erroneous conclusions. Whenever we hear of locust flights east of the Mississippi, we may rest satisfied that they are not of our Rocky Mountain pest, and are comparatively harmless.

Manhattan, Kas., Oct. 28, 1876.

*The Differential locust (*Caloptenus differentialis*), the Atlantic locust (*Calopterus Atlantis*), and the red-legged locust (*Caloptenus femur-rubrum*).